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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/575,288

Filing Date: April 11, 2006

Appellant(s): VAN DAL ET AL.

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Robert Crawford  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 12 May 2009 appealing from the Office action mailed 17 November 2008.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

5,686,324	Wang	11-1997
4,818,715	Chao	4-1989

6,225,176

Yu

5-2001

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 2, 4-6, 8-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang (US 5,686,324) and Chao.

Regarding claims 1, 2, 5, 6, 8 and 13, Wang discloses in Fig 17-19 a semiconductor device and a method of manufacturing the device, with a substrate and a semiconductor body of silicon (200) which comprises a field effect transistor having a source region (230, N++ on left side) which borders on the surface of the semiconductor

body and which is connected to a lower-doped, thinner source region extension (231, Fig 17 item N-) and having a drain region (230, N++ on right side) which borders on the surface of the semiconductor body and which is connected to a lower-doped, thinner drain region extension (231, Fig 17 item N-), which regions and extensions are of a first conductivity type (n type), and having a channel region situated between said regions and extensions, which channel region is of a second conductivity type (p type), opposite to the first conductivity type, and having a gate electrode (211) separated from the channel region by a dielectric region (209), characterized in that the source region and the source region extension, and the drain region and the drain region extension are in each case connected with each other via an intermediate region (229, Fig 19 item N+) of the first conductivity type, the thickness and doping concentration of which range between those of the region and the extension and which is formed by an ion implantation carried out at an acute angle (45°) with the normal to the surface, and further wherein a sloped spacer (226) of an electrically insulating material is situated on the semiconductor body on either side of the gate electrode and directly contacting the intermediate region (229) and the associated extension (231).

Wang does not specify wherein each of the gate electrode, the source region and the drain region being provided with a respective connection region containing a metal silicide. Chao teaches that a connection region to a gate, source and drain are formed of silicide in order to reduce resistance of interconnects (col 2 ln 44), characterized in that the connection region is recessed in the semiconductor body (see Fig 5i) and that the metal reacts with silicon to form the metal silicide. It would have been obvious to

one of ordinary skill in the art at the time of the invention to use the teachings of Chao on the device of Wang in order to reduce the resistance of the interconnects.

Regarding claim 4, Wang discloses the device of claim 1. The claim language "the intermediate region is formed by means of ion implantation" describes a product by process. See MPEP 2113. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Regarding claim 10, Wang discloses the method of claim 5, characterized in that the source region and the drain region are formed by means of an additional ion implantation (implant 232), and the intermediate region is formed immediately before the formation of the source region and the drain region (col 8 ln1-3), and all these regions are tempered in the same heat treatment (annealing step, col 6 ln 10).

Regarding claim 11, Wang discloses the method of claim 5, wherein the source region extension and the drain region extension are formed by means of an additional ion implantation step (Fig 17).

Regarding claim 12, Wang discloses the method of claim 8, wherein the angle is about 20 degrees to about 40 degrees (angle between 0 and 60 degrees, col 8 ln 5).

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang and Chao as applied to claim 5 above, and further in view of Yu.

Wang and Chao disclose the method of claim 5, and Wang further teaches that ion implantation should be carried out at a flux of  $1 \times 10^{14}$  at/cm<sup>2</sup> (col 8 ln 2). Wang does not specify that the implant energy be between 0.5 and 10 keV.

Yu teaches that an ion implant may be carried out with an energy of 1-5 keV for intermediate depth regions (see Fig 1 items 23 and 25, Fig 4 and Fig 5 area between 40 and 42, and col 5 ln 30). However, the implant energy would have been obvious to an ordinary artisan practicing the invention because, absent evidence of disclosure of criticality for the range giving unexpected results, it is not inventive to discover optimal or workable ranges by routine experimentation. *In re Aller*, 220 F. 2d 454, 105 USPQ 233, 235 (CCPA 1955). Furthermore, the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ 2d 1934, 1936 (Fed. Cir. 1990).

#### **(10) Response to Argument**

Applicant's arguments have been fully considered but they are not persuasive.

Regarding the Argument on page 5 that the referenced "Chao" and "Yu" references were not identified: both Chao and Yu were identified and made of record in

the Office Action and PTO- 892 dated 16 May 2008. There are no other Chao or Yu references, and since the Applicant reproduces the relevant figures from the Chao reference, it is apparent that the references have been made of record.

Regarding the argument on page 5 that the proposed modification of the '324 reference renders the reference inoperable for its purpose: the '324 reference discloses each of the claimed limitations except wherein "each of the gate electrode, the source region and the drain region being provided with a respective connection region containing a metal silicide". Chao teaches that a connection region to a gate, source and drain are formed of silicide in order to reduce resistance of interconnects. Applying silicide contacts to the gate, source and drain would not render the device inoperable, but is preferred by Chao to reduce contact resistance.

Applicant argues that the stated purpose of the '324 reference involves combined etch/formation steps and (page 6 of Brief) that the '324 reference teaches away from the proposed modification because forming self-aligned silicide of the respective gate, source and drain contacts would undermine the aforesaid stated purpose in requiring additional steps. This is not persuasive because the '324 reference does not teach away from an additional silicide step as taught by Chao. Disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments. *In re Susi*, 440 F.2d 442, 169 USPQ 423 (CCPA 1971). "A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." *In re Gurley*, 27 F.3d 551, 554, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994). Moreover, the '324

reference describes a method that defines contact openings and then 'performs remaining process steps' (col 6 ln 13-15). One such remaining process step may obviously be the silicide contact formation as taught by Chao.

Regarding the argument on page 7 that the '715 reference does not teach a recessed silicide contact at a source and drain region, and to a similar contact at a gate region: Fig 5i of the '715 reference clearly shows a silicide recessed into a semiconductor body (i.e. the silicide region goes below the surface of the silicon substrate, and below the top surface of the polysilicon gate). The argument on page 9 that this silicide is not recessed because it also extends above the source and drain is not persuasive because "recessed" does not preclude a portion from extending above the surface.

Regarding the argument on pages 9 and 10 that the asserted requirements of criticality are contrary to the M.P.E.P. and applicable law: Applicant argues that the rejection of claim 9 is improper because no evidence is cited in support of the assertion that one of skill in the art would be motivated to modify the '324 reference to include the indicated ion implant energy used in the '176 reference, and furthermore no explanation as to how the '324 reference could operate under such conditions was given. However, Yu teaches that an ion implant may be carried out with an energy of 1-5keV for intermediate regions (Yu Fig 1 item 23 is an intermediate region similar to Wang Fig 19 item 229) and it is known in the art that the implant energy determines the depth of an ion implant. The range of energy specified by Yu meets the limitation claimed in claim 9, therefore one of ordinary skill in the art could have combined the elements as claimed

by known methods with no change in their respective functions, and the combination yielding no more than predictable results.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

John Ingham

/John Ingham/

Examiner, Art Unit 2814

Conferees:

/Wael M Fahmy/

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TQAS TC 2800